Bellcomm
955 L'Enfant Plaza North, S.W.
Washington, D. C. 20024

date: September 29, 1971

to: Distribution

B71 09031

from: S. S. Fineblum

subject: LM Ascent Water Margins and the Possibility of Off-Loading - Case 320

MEMORANDUM FOR FILE

The off-loading of excess LM consumables is an attractive approach to permit increased supplies for lunar surface activity. The apparent excess of ascent water, as summarized in the attached table and figures, suggests that such water is a likely candidate for off-loading. The available water at ascent stage impact is generally greater than 100% of that actually consumed during the mission. (Note Figure 2.)

The worst condition from a water consideration is the loss of one water tank at ascent stage launch. An active LM requires only 13.5 pounds of water to provide cooling for a nominal rendezvous with an addition of eight pounds for the contingency of another revolution. This 21.5 pounds in each tank plus 4.2 considered unavailable totals 47.2 pounds. Without a tank failure, this quantity of water would still be in excess of that required to cool the ascent stage through LM close-out and a guided lunar impact.

In addition, tests show that the electronic equipment stays safely below specified temperature limits for approximately three hours or more after a complete loss of cooling.

During mission 13, when the LM acted as a life boat, the total usage was only 48 pounds.

The off-loading of approximately 30 pounds of ascent water would provide a quantity (55 pounds) in excess of that required for a full mission or for a safe rendezvous with one failed tank.

Sol Fineblum

2031-SSF-jf S. S. Fineblum

Attachments

(NASA-CR-125829) LM ASCENT WATER MARGINS AND THE POSSIBILITY OF OFF-LOADING (Bellcomm, Inc.) 5 p

N79-72037

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PLANNED MARGINS AND ACTUAL

REMAINING USABLE - LM ASCENT WATER

Apollo Mission	Loaded* Usable	Planned Use	Actual Use	Planned Margin	Remaining Usable
11	80.8	34.6	37.3	46.2	43.5
12	80.8	45.4	22.0	35.44	58.8
13	80.8	41.5	48.0	39.3	32.0
14	80.8	14.7	29.3	66.1	51.5
15	80.8	45.3	15.0	19.3	69

*85 lbs. loaded; 4.2 lbs. unavailable.

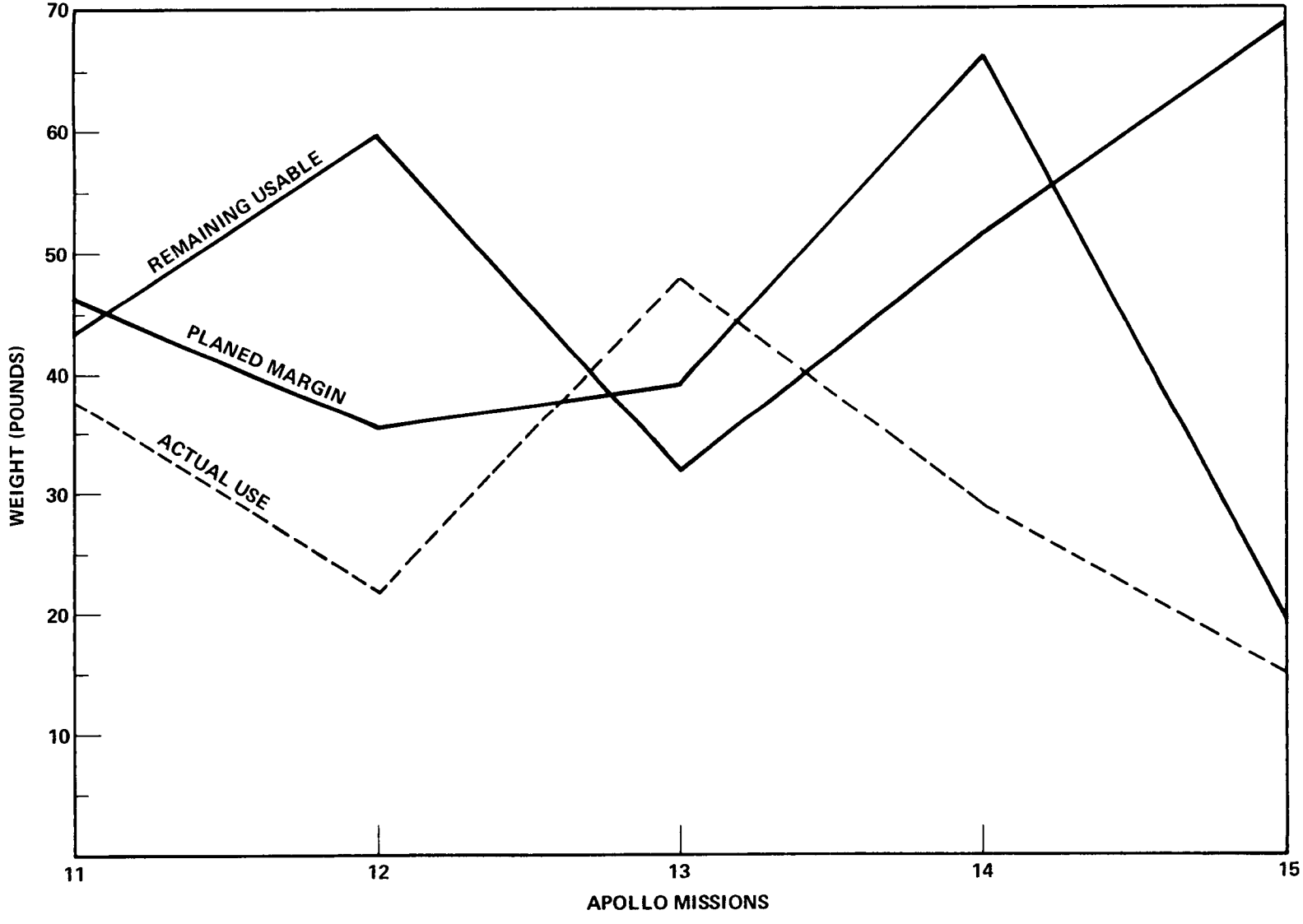

FIGURE 1 - PLANNING MARGINS VERSUS REMAINING USABLE LM ASCENT WATER

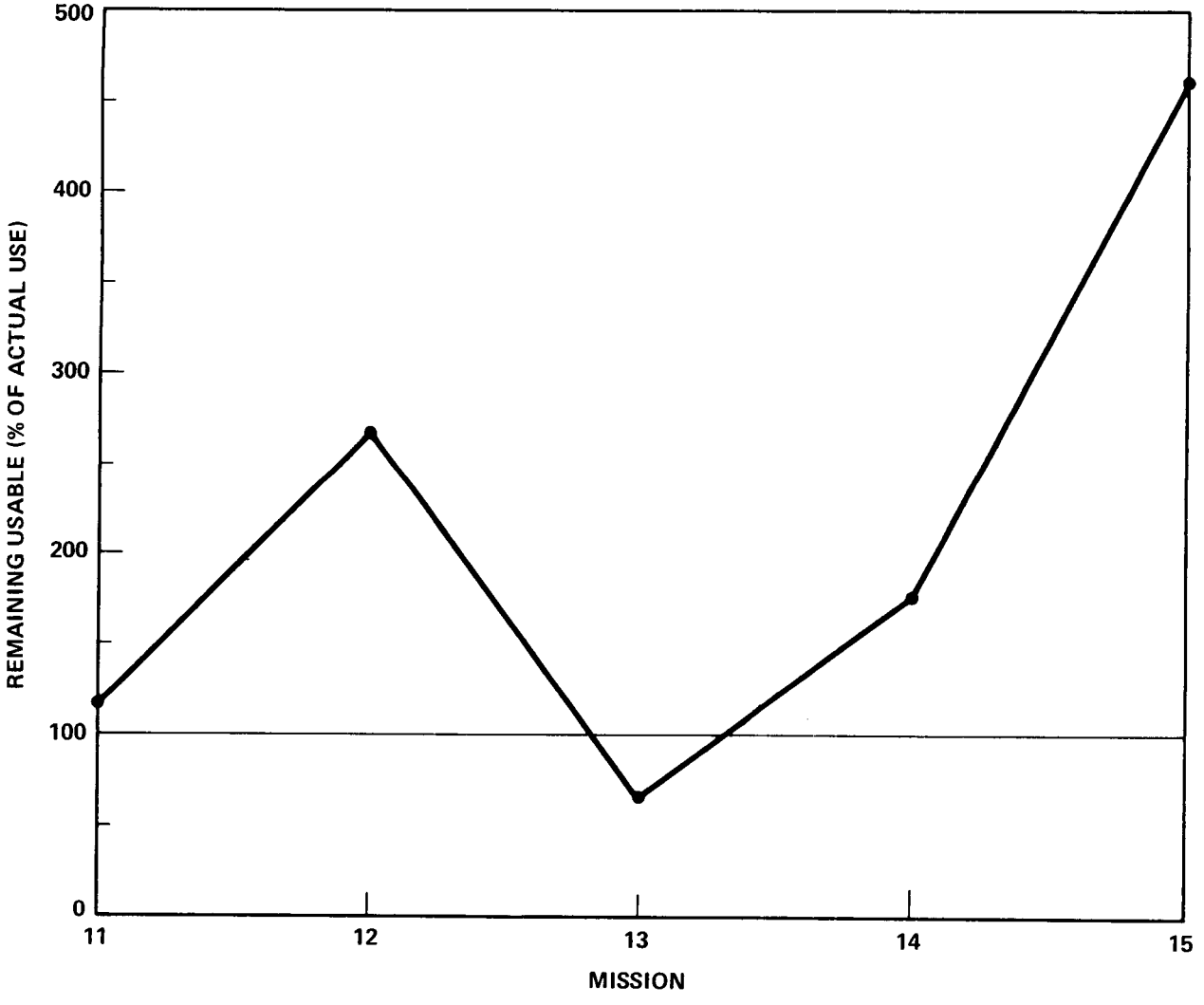

FIGURE 2 - LM ASCENT STAGE WATER REMAINING AT SEPARATION

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